Helicopter money: survey evidence on expectation formation and consumption behaviour

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Abstract

The effects of helicopter money on expectations and economic outcomes are empirically largely unexplored. We fielded a representative survey among the German population, randomly assigning respondents to various unconventional monetary policy scenarios that raise household income. We find that in all policy treatments people spend almost 40% of the transfer, which is a non-trivial share that could increase aggregate demand. Policies do not raise inflation expectations. Differences in how transfers are implemented appear to be mostly irrelevant because of idiosyncratic behaviour by households that largely does not take into account general equilibrium effects and governments' future policies.

JEL-classification: E21, E52, E58, E63

'Let us suppose now that one day a helicopter flies over this community and drops an additional $1000 in bills from the sky, which is, of course, hastily collected by the members of this community. Let us suppose further that everyone is convinced that this is a unique event which will never be repeated.' (Friedman, 1969, p. 4-5)

1   Introduction

Following the emergence of the world economic crisis in 2007, central banks implemented various monetary policy measures with the aim of stimulating nominal demand. These ranged from standard downward adjustments in nominal interest rates to unconventional quantitative easing and forward guidance. Notwithstanding some positive effects, the final outcomes and effectiveness of these measures remain ambiguous (Kapetanios et al., 2012). Calls have been made to extend the toolbox of unconventional monetary policies by recurring to helicopter money as a measure to directly inject money into the economy, see, for example, Muellbauer (2014) or Wren-Lewis (2013). By giving cash to households, it has been argued, indirect monetary policy channels would be circumvented, thus making central banks' policies more effective. Helicopter money was first talked about by Milton Friedman (1969) and taken up in a speech by Ben Bernanke[1] which addressed the Japanese slump. The idea of helicopter money as a further actual means of monetary policy making – Milton Friedman introduced it as a thought experiment – is intriguing. Its potential implications are, however, largely unexplored, most importantly from an empirical point of view. Little is known on how households would respond to it, and whether households' behaviour would depend on how the policy is implemented.

In this paper, we analyze the potential consequences of various forms of helicopter money on households' spending decisions and how it changes their expectations. To this end we fielded questions in a survey which constitutes a representative sample of the

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[1] 'Some thoughts on Monetary Policy in Japan', The Federal Reserve Board, Remarks by Governor Ben S. Bernanke before the Japan Society of Monetary Economics, Tokyo, Japan, May 31, 2003.

German population. The survey allowed us to randomly divide the participants into four sub-groups. We treated one group with a lottery win scenario in order to derive a baseline against which we can compare the aggregate policy effects. The other three groups were confronted with distinct versions of unconventional monetary and fiscal policy scenarios. The policy scenarios differed in terms of how the policy would be funded and in terms of the pace of policy implementation. The survey participants were subsequently asked about the amount of the transfer they would eventually spend and about their expectations regarding the policies' impact on the economy.

Central results of the survey are that households would consume almost 40% of the transfers given to them, and that the policies would not increase households' inflation expectations. The spending shares are hardly affected by the way in which the policy is financed. Whether the central bank would print the money and transfer it directly to the households or whether the treasury would borrow the money from the central bank and transfer it to the households barely influences consumers' choices. Moreover, we show that multiple payments of smaller amounts do not constitute a more effective policy than a one-time payment of an equivalently larger amount.

Various pieces of information provided by the survey allow us to further evaluate the causes of these results. We find that no policy seems to be able to convince the households of being able to have longer-lasting positive effects on the economy as a whole. This could explain why households do not spend a significantly larger share of the transfer when we compare consumption choices to a lottery win. While we find evidence for Ricardian equivalence, the fraction of households who would act accordingly appears to be too small to make a difference in the policy treatments. We also present evidence that the policies introduce a great deal of uncertainty that might further contribute to the reluctance of the households to spend the transfer. Finally, an analysis of the policy effects along various socio-economic characteristics of the respondents does not elicit group-specific effects on spending shares or inflation expectations. Overall, households' reaction to the

policies is characterized by a great deal of idiosyncratic behaviour.

Although still little is known about helicopter money, researchers seem to agree on its (in theory) high efficacy in stimulating nominal demand. Using a rigorous macro model Buiter (2014) concludes that '... a permanent helicopter drop of irredeemable fiat base money boosts demand both when Ricardian equivalence does not hold and when it does. It makes the deficient demand version of secular stagnation a policy choice, not something driven by circumstances beyond national policy makers' control'. Turner (2015) asserts that '...money financed fiscal deficits will certainly and in all circumstances stimulate aggregate nominal demand. While monetary stimulus working through expectations channels might'. Galí (2014) used DSGE models to examine the effects of monetary finance under classical and New-Keynesian assumptions and concluded that under a realistic calibration of nominal rigidities '... a money-financed fiscal stimulus is shown to have very strong effects on economic activity, with relatively mild inflationary consequences'. These theoretical contributions predict that a survey such as ours should find a significant, non-zero spending out of money financed stimulus policies. Further, helicopter money, it is claimed in these contributions, will increase aggregate nominal demand even in the presence of Ricardian equivalence. This prediction is in contrast to the well known assertion that government debt is not increasing private wealth as households internalize the government budget constraint (Barro, 1974). What distinguishes helicopter money from government policies financed by the issue of interest-bearing debt is, however, an asymmetry between the private sector and the government, c.f. Turner (2015, p.7). While the monetary base is an asset for the private sector it is a purely notional liability for the government given that it is irredeemable and non-interest bearing. With helicopter money the private financial assets increase without an offsetting increase in the rationally anticipated future taxes. Therefore, one should expect that our survey participants will spend more out of helicopter money than in our treatment where the government finances the cash transfers by borrowing the money from the central bank.

In contrast to the theoretical literature, empirical research that touches upon the consequences of unconventional monetary and fiscal policies did not yield many contributions regarding the effects of helicopter money. Either the focus of the research was on examining the effects of unconventional monetary policies such as forward guidance (see, e.g., Campbell et al., 2012; Giirkaynak et al., 2005) and quantitative easing (see, among others, Krishnamurthy and Vissing-Jorgensen, 2011; Lenza et al., 2010), or the fiscal expansion analyzed was not financed by an increase in the monetary base. This literature on the non-money financed fiscal stimulus is, however, in very close connection to our work. Of particular prominence are the studies on the U.S. tax rebates in 2001, see, e.g. Agarwal et al. (2007) or Shapiro and Slemrod (2003), and in 2008, see, e.g., Bertrand and Morse (2009), Misra and Surico (2014), Parker et al. (2013), or Shapiro and Slemrod (2009). Mostly authors find substantial fractions of the transfers being spent by the recipients. However, there is hardly any empirical contribution which elaborates the likely consequences of helicopter money. The reason for this is apparent: throughout history, controlled and well managed monetary-fiscal cooperations conducted with the goal of a gradual increase in nominal demand hardly ever took place. Either the monetary financing was a result of unsustainable fiscal expansions leading to the loss of central bank independence and high levels of inflation, or it was prohibited by law in order to help central banks maintain low inflation goals.[2] Thus many questions related to this important topic are still unanswered. This is where we want to add to the existing literature.

Parallel and independent of our study there were, to the best of our knowledge, two other studies commissioned. First ING (2016) conducted an internet poll in 12 European countries, inquiring mainly about the share of helicopter money households would spend and whether they thought that such a policy would contribute to growth. Second, similar to our approach, van Rooij and de Haan (2016) have a more elaborate take on the topic,

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[2]For a short historical perspective on monetary finance see Saravelos et al. (2016), pages 5-7.

with randomized treatments varying the policy for a Dutch sample of households. We depart from them in various aspects. First, we conduct a study on Germany, the largest economy in the eurozone. Second, we are interested in the effects of helicopter money on a larger set of expectations including but not limited to inflation expectations. Third, we are able to analyze the potential causes of the survey participants' answers on how much of the transfer they would spend. Despite the differences, however, all three studies on the likely effects of helicopter money come, where comparable, to similar results, in particular regarding the shares of helicopter money consumed. This is comforting, and may help to safeguard the approach of recurring to survey data that measures peoples' intentions rather than their actual consumption behaviour against the usual critique.

We proceed with Section 2, which describes the survey from which our data stems. Section 3 introduces the treatments and discusses our predictions, and Section 4 presents the results. In Section 5 we conclude.

2   Survey methodology and data

We use data from the GESIS panel for our analysis.[3] The GESIS panel is a probability-based mixed mode access panel that provides the social science community an opportunity to collect survey data. Mixed mode implies in our case that about 2/3 of the panelists participate online via web-based surveys and the rest participates offline by mail. Probability-based means that all members are recruited randomly so that the sample is representative of the population, aged between 18 and 70 years at the time of recruitment and residing permanently in Germany. In February 2014, when the panel was started, it contained about 4900 panelists. The survey takes place bi-monthly, consisting of questions that can be answered in about 20 minutes. Each survey consists of

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[3]GESIS is the acronym for 'Gesellschaft Sozialwissenschaftlicher Infrastruktureinrichtungen e. V.', which is a member of the 'Leibniz Gemeinschaft' nowadays: 'gesis - Leibniz-Institut für Sozialwissenschaften'.

two parts. About five minutes of the interviewing time of each survey is reserved for a longitudinal core study which touches on topics developed by the GESIS itself. The rest of the time is reserved for submitted studies from external researchers. We applied for such a study, which successfully underwent a peer-reviewing process.

Besides drawing on the answers to the questions that we could place in one of the waves by ourselves, a large set of accompanying information is available mostly from the longitudinal studies conducted by the GESIS. We can also use these variables which allows us to add a rich set of socio-economic characteristics of the panelists to our study. Finally, as another feature of the GESIS online panel, panelists can be randomly divided into up to four sub-sets. We made use of this possibility and constructed four different treatments of unconventional monetary and fiscal policies with which the panelists were confronted.[4]

Our questions were fielded in spring 2016. At that time, real GDP had grown at a rate of 1.5% with respect to the first quarter in 2015 in Germany compared to a growth rate of 1.7% for the eurozone. Unemployment rates kept falling and reached 4.1% for 2016, thus being significantly lower than the average of 8.6% for the eurozone in that year. Inflation, measured by the BIP deflator, was at 0.08% in the eurozone but at 1.67% in Germany. These differences in the economic performance indicators for Germany with respect to the average values reflect the heterogeneity of the eurozone countries. While some countries, mostly those in southern Europe, show even more remarkable differences with respect to Germany, other countries, such as the Netherlands or Austria, fared equally at that time.[5]

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[4]In the Online Appendix we show evidence that randomization is actually achieved.

[5]Data is from Eurostat `http://ec.europa.eu/eurostat/web/national-accounts/data/main-tables`.

3 Treatments

3.1 The survey questions

The treatments were formulated to mimic the policy debate on how to actually design and implement helicopter money in practice, see, e.g., Reichlin et al. (2013). A major issue in the policy-related debate has been whether the monetary authority should directly inject the money into the economy by giving checks to households, or whether it should finance the fiscal authorities who then spend the money. Furthermore, if it were the role of the central bank to finance the fiscal policies of the government, should it do so by buying government bonds declaring that it will not undo the money creation, or should the central bank simply transfer newly created money to the government?

We tried to shed light on these issues by randomly splitting the survey participants into four equally representative groups. Then, each group was faced with a different (policy) scenario. These were the four different treatments:

T1: Lottery

T2: Money financed fiscal stimulus

T3: Helicopter money one-time payment

T4: Helicopter money multiple payments

In all four treatments households were confronted with a situation in which they would hypothetically receive 1200 euro. The chosen amount is a compromise between the size of transfers that one can typically observe in tax rebate studies and the per-capita size of the quantitative easing program of the European Central bank. That is, it is larger than the tax rebates of the US government following the 2001 and 2008 crisis but lower than the 5600 euro at which one arrives if the initially envisaged monthly purchases of the European Central Bank of about 80 billion euro for two years are divided by the

population of the Eurozone.

In treatment T1 participants encountered a scenario where they won 1200 euro in a lottery. It serves us as a baseline treatment for comparisons with the policy treatments. As there is no macroeconomic policy involved in this treatment, people should consider this windfall fully as net wealth. In particular, participants were asked (in German) what they would do in the following situation:

(T1) *'Imagine you just won 1200 euro in a lottery. Given your current financial situation how much of the 1200 euro would you spend, save/invest or use to pay off debt in the next 12 months?'*

In this treatment, as in the other three treatments, respondents had to fill in the respective amount:

'I would spend _ _ _ euro.'

'I would save/invest _ _ _ euro.'

'I would use _ _ _ euro to pay off debt.'

Treatment T2 is a policy treatment where the government would provide a fiscal stimulus which is financed by the central bank *lending* the money to the government. In particular, participants had to decide what they would do with the additional money given the following situation:

(T2) *'During current economic and political discussions concerning best management of the European economic crisis the following position has emerged: The government of each Eurozone member state should give money directly to its citizens. The money for this endeavor should be borrowed by governments from the European Central Bank. Imagine such a policy was actually approved and you, along with every other citizen in the Eurozone, received a one-time payment of 1200 euro from the government.'*

'Given your current financial situation how much of the 1200 euro would you spend, save/invest or use to pay off debt in the next 12 months?'

Helicopter money was distributed in treatment T3. In this scenario households were told that they would receive a transfer directly from the central bank. Participants had to decide what they would do with the additional money given the following situation:

(T3) *'During current economic and political discussions concerning best management of the European economic crisis the following position has emerged: The European Central Bank should give money directly to the citizens of the Eurozone. The money for this endeavor should be printed by the European Central Bank. Imagine such a policy was actually approved and you, along with every other citizen in the Eurozone, received a one-time payment of 1200 euro from the European Central Bank.'*

'Given your current financial situation how much of the 1200 euro would you spend, save/invest or use to pay off debt in the next 12 months?'

Contrary to treatment T2, the role of the central bank in treatment T3 is to distribute the money by itself rather than lending it to the fiscal authority thus financing a fiscal

stimulus.

Finally, in T4 we presented to the fourth treatment group a variant of the helicopter money policy in which citizens would receive a stream of payments over the upcoming 12 months instead of a one time payment as in T3. Slightly altering the scenario, participants had to decide what they would do with the additional money given the following situation:

(T4) *'During current economic and political discussions concerning best management of the European economic crisis the following position has come forth: The European Central Bank should give money directly to the citizens of the Eurozone. The money for this endeavor should be printed by the European Central Bank. Imagine such a policy was actually approved and you, along with every other citizen in the Eurozone, will receive 100 euro per month from the European Central Bank for the next 12 months.'*

'Given your current financial situation how much of the monthly 100 euro would you spend, save/invest or use to pay off debt during the next 12 months?'

Where possible the wording of our questions mimics earlier studies on intended consumption following government policies.[6] For all four treatments we filed accompanying questions on what respondents' expected in terms of price changes, development of the economic situation, government obligations, and taxes in the upcoming years. The exact wording of these questions is given in the Online Appendix. Again we phrased the questions as in other studies where possible. These accompanying questions will help us to analyze more closely the effects of the respective policies, and elaborate more deeply on the causes of our main findings.

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[6]We summarize comparable surveys in Table 4 of the Online Appendix.

3.2 What answers to expect?

Although there is no particular theoretical model that could tell us how the respondents should answer the questions at hand, a few predictions on the spending responses may be made. With treatment T1 we establish a benchmark against which we can compare the policy treatments. In treatments T2 to T4 respondents additionally consider the policies' aggregate effects. Expectations regarding the policies' effects on future economic conditions, taxes, and inflation may translate into differences in consumption choices.

The life-cycle and permanent income hypotheses (Friedman, 1957; Modigliani, 1986) suggest that people's consumption behaviour is not altered by temporary measures but rather only by the changes in permanent income accompanied by the changes in expectations on future economic conditions. Thus, if the policies were positively perceived, i.e., if respondents expect they will boost the economy, they should (ceteris paribus) result in spending shares higher than those in treatment T1. In contrast, a negative perception might actually induce respondents postponing consumption and saving the bigger fraction of the transfer.

Next, in relation to Ricardian equivalence, our predictions on the spending shares depend on whether respondents are forward looking or not. If private agents are not forward looking they will consider the cash transfers as an increase in net wealth and raise their consumption level contrary to the prediction of the theory (Barro, 1974). In this case, we would expect the consumption shares in T2 and T3 to be similar as the government's intertemporal budget constraint is not being taken into account. In contrast, forward looking households will expect higher future taxes following a policy (at least in T2) and thus are expected to spend the smaller share of the transfer. Consequently, in the presence of rational, forward looking households, we expect spending shares in T2 not being higher than in the baseline treatment.

If the monetary authority distributes the money by itself (rather than a government financing the transfers by interest-bearing debt), the effectiveness of the policy may not

be diminished by Ricardian equivalence. The reason is, as argued by Buiter (2014), Galí (2014), and Turner (2015), that there is an asymmetry between the private sector and the government. Since helicopter money is irredeemable and non-interest bearing for the government it constitutes a purely notional liability. For the private sector, it is argued, the monetary base is an asset. It furthermore does not decrease via an offsetting effect of rationally anticipated future tax increases so that helicopter money may raise nominal aggregate demand. Thus, one should expect that spending shares of the transfer are higher in T3 than in T2.

The public, however, may have doubts about the expansionary effect of the transfer even if the central bank does it by itself. Households may conjecture that the central bank uses other (un)conventional policy measures to sterilize the expansionary effect of the helicopter drop. It is also conceivable that the public expects a tighter government budget in the future even as a result of a helicopter drop. This may be the case if such a policy reduces the central bank's surplus that otherwise would have gone to the government, or if the helicopter drop requires a re-capitalization of the central bank by the government. In these cases, we would not expect spending shares to be higher in T3 than in T2.

Regarding treatment T4 one may conjecture that the effectiveness of the policy can be improved by not paying out total transfers at once. In a set of very influential papers Shefrin and Thaler (2004) and Thaler (1985; 1990) argue that so called mental accounts are important for properly understanding consumer choices. The central idea of the mental accounting framework is that people use different accounts in their minds, e.g. current income or assets accounts, for the same resource (money) and that the account to which it is booked may depend on the size of the windfall. Consequently, marginal propensities to consume out of an additional income differ according to which account the individual booked it, which itself is a function of the size of the amount. In particular, as small gains relative to income would be coded as current income more of it would be

spent, whereas larger transfers would enter the assets account out of which the marginal propensity to consume would be lower. Thus, spending shares of the households should be higher in T4 than in T3.

4 Results

In the following we first report on the effects of the various policies on the spending decisions and inflation expectations of the households. Both variables may be considered as particularly relevant for evaluating the effectiveness of a helicopter drop as the quantitative easing policies conducted by the major central banks after the financial crisis did not yield outcomes with respect to these two variables that central bankers quite likely hoped for (Kapetanios et al., 2012). Inflation expectations stayed low and output effects were lower than was expected at the time when the programs were launched. In a second step, we try to better understand households' spending decisions and inflation expectations across the three policy treatments. In particular, we shed light on whether the policies' effects on househoulds' expectations regarding economic growth and future taxes can help us to better understand the main findings. We also try to elicit whether there is heterogeneity in the policy effects along various socio-economic characteristics of the households.

4.1 Would the money be spent?

In Figure 1 we summarize the findings on what the money would be used for in each of the treatments. On average, subjects indicated that they would spend 468 euro of the 1200 euro of the lottery win (T1), 449 euro when the treasury transfers money to the households financed by borrowing it from the central bank (T2), 451 euro when the central bank makes a one-time drop of the helicopter money (T3), and 429 euro if the helicopter money is distributed in smaller amounts over the upcoming 12 months (T4).

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In all four treatments more than 500 euro would be saved while the rest would be used for repaying debts.

Overall, a sizeable amount of roughly 40% of the transfers would be spent by the households. This is roughly the magnitude that is also found in studies on the U.S. tax-rebate in 2008 (see, e.g., Bertrand and Morse, 2009; Misra and Surico, 2014; Parker et al., 2013; Sahm et al., 2010; Shapiro and Slemrod, 2009), and studies conducted by various pollster firms, see Table 4 in the Online Appendix. Spending shares are similar and statistically not different from each other when comparing the four treatments. This is also mostly true for the saving and repaying debt choices. Neither does pure helicopter money increase spending shares as one might have concluded from households internalizing the government budget constraint, nor do households declare that they would spend more if the money was distributed in smaller amounts as suggested by the mental accounting theory.

4.2   Effect on inflation expectations

In all treatments (T1 to T4) subjects were asked about their inflation expectations. In treatments T2, T3, and T4, they were explicitly reminded to take into account the transfer policies in the expectation formation. On average, we get inflation expectations of 2.8%, 2.3%, 2.6%, and 3.8% for treatments T1 to T4, respectively. Given the rather large variation in answers, the differences in the means between T1 and the policy treatments (T2 to T4) turn out to not being statistically different at the 5% significance level, see Table 1. Apparently, no policy would be able to increase inflation expectations although a sizeable share of the transfers would be spent by the households.

4.3   Mechanisms

We try to shed more light on the potential causes of the main findings on spending shares and inflation expectations in the following. The hope is that we can trace more closely

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Figure 1: Spending, saving, and debt repayments
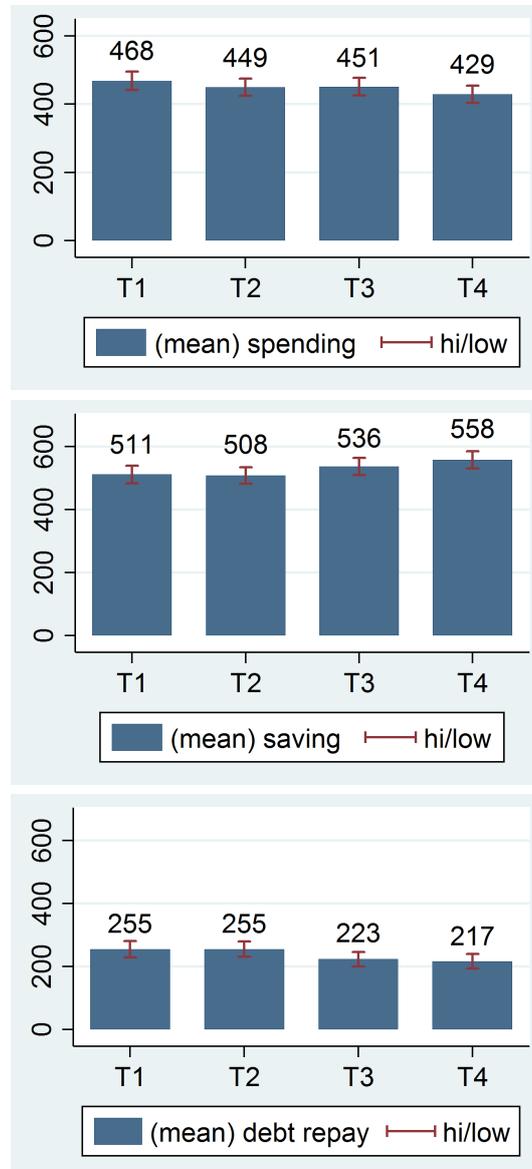
Notes: The figure summarizes the findings on what the money would be used for in each of the policy treatments. The first graph displays the average amounts that would be spent in all of the four treatment groups. Similarly, the second and the third graph present the average amounts that would be saved and used for debt repayments, respectively. The red lines named 'hi/low' represent the 90% confidence intervals. It is worth noting that, when looking at any particular treatment, the spending, saving, and debt repaying amounts do not necessarily add up to exactly 1200 euro, which is due to the averaging of the data.

Table 1: Inflation difference in the means tests

	$\mu_{T2} - \mu_{T1}$	$\mu_{T3} - \mu_{T1}$	$\mu_{T4} - \mu_{T1}$
Diff. in the means	-0.43	-0.16	1.00*
	(0.33)	(0.37)	(0.54)
Obs.	1620	1618	1628

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Notes: The table compares the means of inflation expectations in the policy treatments T2, T3, and T4 with the mean of inflation expectations in T1. For each policy treatment (T2, T3, and T4) the difference in the means of inflation expectations between that particular treatment and T1 is calculated and presented in columns $\mu_{T2} - \mu_{T1}$, $\mu_{T3} - \mu_{T1}$, and $\mu_{T4} - \mu_{T1}$, respectively. Differences are expressed in percentage points. Standard errors are given in parentheses. Source: Authors' calculations.

some of the potential explanations with the answers to the additional questions asked on households' expectations and their socio-economic background.

4.3.1 Expectations on economic conditions

Money given away to the subjects in any of the three policy treatments did not affect consumption behaviour compared to the lottery treatment. We would have expected a positive effect on the marginal propensities to consume according to the permanent income hypothesis (Friedman, 1957) and the life-cycle hypothesis (Modigliani, 1986) *if* the households were convinced that the policies are turning around the economy and have not only a transitory but also a permanent effect on their income. As we asked subjects in each treatment about their expectations on the policies' effects on the economy, we can analyze this hypothesis further.

Respondents could choose between the three possible answers that the policy would improve, impair, or not change the economic situation. The shares of subjects choosing either of the three options in any of the three policy treatments are shown in Figure 2. Irrespective of the policy treatment roughly more than one third of the respondents opted

for a worsening of the economic conditions, about one half expressed the opinion that the policies would not have an effect on the economy, and the remaining and smallest share of respondents believed that the policies would actually improve the economic situation. In order to statistically compare the policies' effects we ran a multi-nominal logit model for all combinations of treatments, with the three answers as the dependent variable and the treatment dummy as the only regressor. It turns out that from a statistical point of view the answers do not differ across the treatments T2 to T4.

The observation that more than 8 out of ten respondents expect either no change or a worsening of economic conditions complies with our finding that there is no difference in the marginal propensity to consume between the (individual) lottery treatment (T1), and the economy wide policies T2 to T4. Moreover, as expectations on economic conditions do not differ between the policy treatments, it is also not surprising that the marginal rates of consumption were equal across the policy treatments. It seems that the payments were more like a windfall profit for the subjects than convincing them that incomes would improve permanently due to a better economic outlook. Perhaps households rationally expected that transfers were too short-lived to constitute a substantial increase in permanent income that would have lead to a larger fraction of the transfer spent.

4.3.2   Ricardian equivalence

The households' pessimistic evaluation of the three policies in relation to the economic outlook may already serve as an explanation for why we observe similar spending decisions in the policy treatments and treatment T1. Still, one may wonder whether the lack of any differences in the consumption shares between the money-financed fiscal stimulus and the pure helicopter money is driven by households not acting according to Ricardian equivalence. Ricardian equivalence, see, e.g., Barro (1974) or for a review Seater (1993), suggests that forward looking consumers internalize the government's budget constraint.

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Figure 2: Expectations on economic conditions
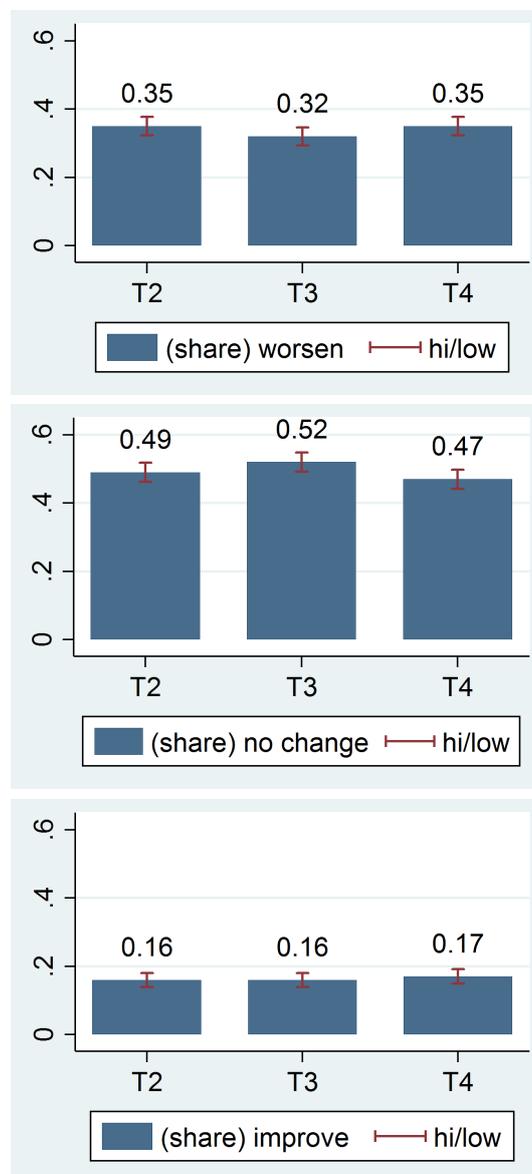
Notes: The figure displays the policy effects on respondents' expectations regarding future economic conditions. As there is no policy involved in T1, it is excluded from this analysis. Results reported for T2 to T4 are treatment specific and are not compared or expressed relative to T1. The first graph shows the share of people who expect policies T2 to T4 to lead to a *worsening* of economic conditions. The second and the third graph show the shares for the three treatments T2 to T4 for those who expect *no change* or an *improvement* of economic conditions, respectively. In all graphs, the vertical red lines named 'hi/low' represent the 90% confidence intervals.

As a consequence, debt-financed policies should not be able to stimulate demand as households expect higher taxes in the future to finance increased future government obligations. Rather than using the additional current income for consumption it would be saved to pay the future bill.

We can address the question to what extent Ricardian equivalence is responsible for the respondents' choices with information from the survey. We asked households to give us their assessment on whether the policy with which they were hypothetically confronted would lead to an increase (decrease) in taxes and government obligations in the future. We would expect to find a non-trivial share of people expecting higher futures taxes and government obligations in T2. At the same time, for helicopter money treatments (T3 and T4) these shares should be around zero, at least if households do not expect negative repercussions of the central bank policy on governments' budgets as described in Section 3.2.

Figure 3 summarizes the findings, again using bar charts that give the shares of the three possible answers comparing the policies T2 to T4. In the left panel (a) expected changes with respect to taxes are given, and in the right panel (b) expected changes in relation to future government obligations are reported. Considering the policy influence on tax expectations, for all policies a negligible share of people answered that taxes would actually fall. 24% of the respondents believed that fiscal transfers would not change future taxes (T2), while 30% and 29% believed that taxes would not change in treatments T3 and T4, respectively. An increase in future taxes was expected by 74% of the respondents following a debt-financed fiscal policy. 67% or 68% of the respondents expected an increase in future taxes after a drop of helicopter money by the central bank. While these shares are not close to zero as Ricardian equivalence would have predicted, they are smaller than in treatment T2. Again, we ran a multi-nominal logit model to check for the statistical significance of these results. It turns out that the differences between T2 and T3, and T2 and T4 are also statistically significant.

Figure 3: Expectations on taxes and government obligations across policies
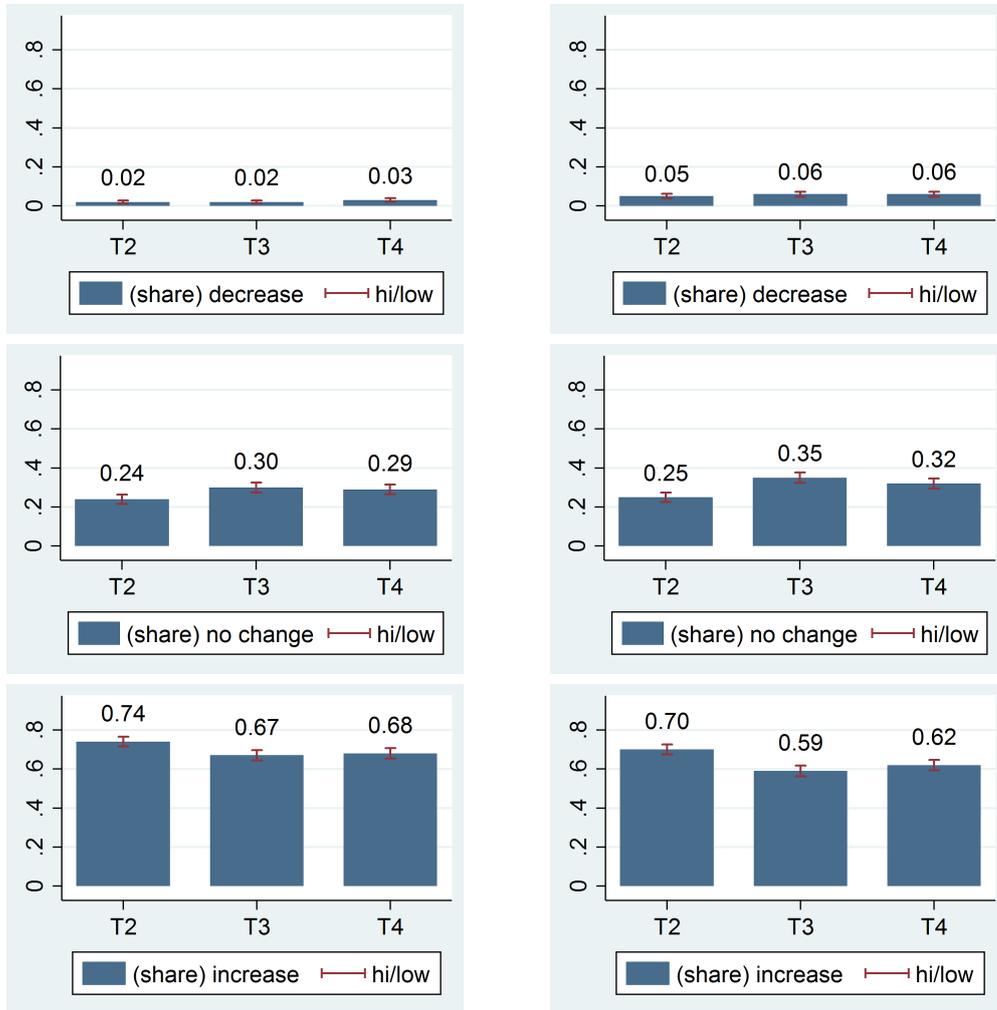
(a) Change in future tax burden   (b) Change in future government obligations

Notes: The figure displays the policy effects on respondents' expectations regarding the future tax burden (panel a) and government obligations (panel b). T1 is excluded from the analysis because there is no policy involved. In panel (a) the first graph shows the share of people who expect policies T2 to T4 to lead to a *decrease* in the future tax burden. The second and the third graph show the shares for *no change* and an *increase* in the tax burden. Panel (b) is constructed similarly for expectations on government obligations. In all graphs, the vertical red lines named 'hi/low' represent the 90% confidence intervals.

In relation to the policy effect on government obligations the share of people who believe that government obligations would decrease is also negligible, see panel (b) of Figure 3. Again, the largest fractions can be observed for those who believe that there will be an increase in government obligations irrespective of what policy treatment we look into. Actually, about 70% of the respondents would expect an increase in government outlays in the years following a T2 policy. A smaller but, again, non-negligible fraction of the subjects chose this option when the transfers were distributed by the central bank (59% in T3 and 62% in T4). These differences are also statistically significant.

Our results reveal that a large share of households confronted with the pure helicopter money policies expect higher taxes and government obligations. At the same time, this share is smaller than in T2, implying that some respondents have an understanding of the differences between a money-financed policy and a pure helicopter money policy in relation to the government's inter-temporal budget constraint. The differences, however, do not seem big enough to translate into different spending shares when comparing the two types of policies.

Notwithstanding, it may still be the case that those respondents who expect a tighter fiscal stance for the future spend less. In order to evaluate this proposition we run regressions on the pooled data for the treatments T2 to T4.[7] The characteristics of the dependent variable being non-negative and truncated at 1,200 suggest the use of a Tobit model rather than ordinary-least-square regressions. Furthermore, one should be aware that, unlike in the previous analysis where we compare spending choices of respondents who were randomly assigned to different treatments, the regression results in Table 2 are descriptive. They condition on outcomes of the treatment, i.e. whether the government obligations, future taxes, economics conditions, or inflation expectations will change due to the policies.

The variables of most interest to us are the respondents' expectations on whether the

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[7]T1 data is excluded because variables related to households' expectations do not include information on policy changes as in T2-T4.

policy will increase the future government's obligations and future taxes, and whether it will have an effect on economic conditions and inflation. The selection of the additional control variables is guided by existing microstudies on consumption behaviour (see, e.g., Bachmann et al., 2015). In Model (1) in Table 2, we include the respondents' answers to the future government obligations but not their answers to future tax expectations. In accordance with Ricardian equivalence, those respondents who expect higher government obligations of the policy spend less of the transfer. Similarly, if we include expectations on future taxes as a measure of the expected fiscal stance, those who believe that taxes will increase spend less again. If both variables are included, as in Model (3), only the parameter on the future government obligations is significant, which is possibly due to the correlation of the two variables. How do these results contrast with survey evidence on Ricardian equivalence of earlier studies? Hayo and Neumeier (2017) find notable deviations from Ricardian equivalence but cannot rule out that the majority of Germans behave at least partly in a Ricardian manner. The only other study we are aware of that uses survey data to directly test the Ricardian equivalence theorem is by Allers et al. (1998). Based on a sample of Dutch households they find little practical relevance of Ricardian equivalence for people's economic behaviour.[8]

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[8]Indirect tests of the theorem, i.e. studies using proxies for Ricardian equivalence, such as individual support for fiscal consolidation, can be found in Heinemann and Hennighausen (2012) or Stix (2013).

Table 2: Effects of expectations on spending

	(1)	(2)	(3)
Exp. government obligations	-88.13**		-75.32**
	(34.47)		(36.81)
Exp. future taxes		-69.87*	-40.28
		(39.86)	(42.56)
Exp. pol. on econ. conditions	108.15***	113.09***	102.95***
	(29.85)	(29.87)	(30.19)
Exp. inflation	0.59	0.56	0.66
	(2.48)	(2.48)	(2.48)
Age	-0.65	-1.04	-0.70
	(1.56)	(1.56)	(1.56)
Gender	177.9***	179.62***	176.70***
	(44.86)	(44.87)	(44.84)
Income	-20.62***	-20.41***	-20.55***
	(5.53)	(5.53)	(5.53)
Change in fin. situation	78.69***	78.74***	77.43***
	(23.47)	(23.45)	(23.47)
Household size	-36.68**	-36.36*	-36.84**
	(18.66)	(18.65)	(18.65)
German	36.06	39.40	37.87
	(71.20)	(71.21)	(71.17)
Distance to city	-5.70	-4.42	-5.49
	(12.56)	(12.56)	(12.56)
West Germany	33.95	28.74	32.59
	(50.56)	(50.59)	(50.58)
Trust in the EU	8.03	7.21	7.43
	(14.49)	(14.49)	(14.50)
Interest in economics	41.31*	40.43	40.74
	(24.91)	(24.93)	(24.92)
T3 dummy	-44.01	-40.20	-45.35
	(48.09)	(47.98)	(48.08)
T4 dummy	-78.53	-79.09	-78.35
	(48.30)	(48.29)	(48.32)
_constant	144.02	110.99	237.86
	(200.9)	(213.37)	(221.18)
Sigma	787.1	787.4	786.6
Pseudo R^2	0.0044	0.0042	0.0044
Observations	1849	1852	1848

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Notes: In columns (1) to (3) the coefficients of TOBIT regressions of spending on the listed explanatory variables are presented. In all three regressions, the sample used for estimation consists of the pooled T2, T3, and T4 data. Observations from T1 are not included because T1 is not a policy treatment. Standard errors are given in parentheses. The reference for the gender variable is female and for the policy treatment dummies T2. Source: Authors' calculations.

In all three regressions the expectations regarding policies' influence on economic conditions are found to be positively correlated with the spending amounts, which is in line with the permanent income and the life cycle hypotheses. Apparently, however, there were too few households who expected a positive effect of the policies on the economy to make average spending shares in treatments T2 to T4 larger than in T1, c.f. Figure 1.

We do not detect an effect of inflation expectations on the spending decision. Comparable analyses based on other microdata have come up with rather inconclusive results on the link between consumption decisions and inflation expectations. For Japan, Ichiue and Nishiguchi (2015) find that households that expect higher inflation plan to decrease future consumption. Using data from the Michigan Survey of Consumers and the New York Fed Survey on Consumer Expectations, Bachmann et al. (2015) find small and often statistically insignificant effects of inflation expectations on the intentions to purchase durables outside of the zero-lower-bound, and a negative association for the times where the economy hit the zero lower bound. Similarly, Burke and Ozdagli (2013) find only weak evidence for the relationship between the two variables, whereas Crump et al. (2015) report a large positive association for a similar data set. Recurring to an announced value added tax increase in Germany, D'Acunto et al. (2016) argue, using consumer survey data from the GFK (Gesellschaft für Konsumforschung), that it first raised inflation expectations and, subsequently, intended purchases of durables. In our analysis, respondents who expect higher inflation rates do not increase their spending today.

The further control variables indicate a higher propensity to spend the transfer for men, a decreasing marginal rate of consumption, a negative effect of the household size, and that respondents who experienced an improvement in their financial situation in the recent past spend more of the transfer. There is no evidence that respondents spent different amounts of the transfers in T3 and T4 with respect to T2.[9]

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[9]Pooling observations from treatments T2 to T4 yields 2356 observations. Including the control

4.3.3 Uncertainty

We conjecture that most of the participants in the survey had never heard of something like money-financed fiscal stimuli or pure helicopter money. They, as recipients of a transfer, might have felt uncertain about the consequences of the policies for them and for the economy as a whole. It is conceivable that this kind of uncertainty may also have played a role for why we do not find any differences in the spending behaviour of the policy treatments and the lottery win. In fact, a growing body of literature has concerned itself with the question of what role economic uncertainty plays for macroeconomic outcomes (see, among others, Bachmann et al., 2013; Bloom, 2009; Fernández-Villaverde et al., 2011).

Table 3: Inflation variance ratio tests

	σ_{T2}/σ_{T1}	σ_{T3}/σ_{T1}	σ_{T4}/σ_{T1}
ratio σ_{T_i}/σ_{T1}	1.12***	1.34***	2.24***
Obs.	1620	1618	1628

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Notes: The table provides a deeper insight into the variability of inflation expectations across different treatments. It compares the standard deviation of inflation expectations in the policy treatments T2, T3, and T4 with the standard deviation of inflation expectations in T1. For each policy treatment (T2, T3, and T4) the ratio of the standard deviations is calculated and presented in a separate column: σ_{T2}/σ_{T1}, σ_{T3}/σ_{T1}, and σ_{T4}/σ_{T1}. The statistical test is on H0: ratio $= 1$ which can be rejected in all three cases at the 1% significance level. Source: Authors' calculations.

Ideally, in order to address this question, one would have posed probabilistic questions that capture uncertainty at the individual level, see, e.g. Coibion et al. (2018). Here, households provide probability distributions for their forecasts. In this case, one could

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variables reduces the sample size to 1848 observations, see Table 2, Model (3). Therefore, one might be concerned that non-response to some of the socio-economic controls biases the estimated parameters on the variables measuring the effects of expectations on spending shares. Running the regressions without the control variables, however, hardly changes the estimated parameters on government obligations, future taxes, economic conditions, and inflation.

have constructed not only distributions of point forecasts across the households but also household-level measures of uncertainty about inflation expectations. We do not have such information but rather proxy uncertainty with a measure that makes use of the distribution of households' answers on average inflation expectations. As Table 3 shows, the variance of expected inflation rates increases substantially and statistically significantly as one moves from the non-policy treatment T1 to policy treatments T2 to T4. While keeping in mind the limits of the measure, one might interpret the increase in the spread of answers as a sign of increasing uncertainty. If so, it would be conceivable that, on top of the explanations on which we have already elaborated, the unconventional monetary policies induce a large deal of uncertainty that lets households shy away from spending the transfers in larger amounts.

4.4 A role for heterogeneity?

Based on the full sample, we did not detect policy effects on consumption behaviour and inflation expectations when comparing the treatments with the reference to a lottery win. Finally, we investigate whether there is heterogeneity in the effects of the policy treatments such that sub-groups among the respondents behave differently from the average. Several contributions to the literature have shown that the predictions of heterogenous agent models differ from what one would expect based on representative agent models. In particular, liquidity constraints could make households unable to increase spending. These constraints could reflect the absence of wealth in households (Zeldes, 1989), borrowing constraints (Heathcote, 2005), or costs of accessing liquid wealth (Kaplan and Violante, 2014). Moreover, in relation to inflation expectations, there are contributions to the literature that try to explain the origins and heterogeneity of inflation expectations with microdata. For example, Bryan and Venkatu (2001) find gender differences in inflation expectations and Malmendier and Nagel (2016) show that inflation expectations stem from a learning process that differs across age groups.

Following analyses that evaluate the effect of tax rebates on consumption choices, see, for example, Misra and Surico (2014) or Parker et al. (2013), we ran regressions where we interacted the policy treatments with variables describing the socio-economic background of the households. For each policy treatment (T2, T3, and T4) we run models

$$y_i = \alpha_1 + \alpha_2 treat_i + \beta X_i' + \gamma[treat_i \# X_i'] + \epsilon_i \tag{1}$$

on our data, in which the dependent variable y_i is either the money that would be spent by respondent i or her inflation expectation. $treat_i$ is an indicator for the treatment dummy being 0 for T1 and 1 for the respective policy treatment. As there is no economic policy involved in T1 (lottery) we take it to be our baseline treatment for comparisons. β is a row vector of coefficients on socio-economic variables, X_i' is a column vector of socio-economic variables for individual i, γ is a row vector of coefficients on the interaction terms, and $[treat_i \# X_i']$ is a column vector of interactions of the socio-economic variables with the treatment dummy.[10]

Various variables have been suggested to capture liquidity constrained households. First, we test for households that belong to three different income groups. Second, following Jappelli (1990), who argues that younger households are more likely to be liquidity constrained because they have lower liquid wealth and high income growth, we also test for three different age groups. Third, we test whether households who report that their financial situation has improved or worsened spend differently from those whose financial situation did not change in the preceding year. We do not find evidence in support of a treatment effect of the policies for any of the sub-groups. As was the case with the average treatment effect of the total sample, compared to the baseline of a lottery win (T1), particular households do not spend more (these results are available upon

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[10]The X_i' vector includes age, gender, income, household size, a German citizenship dummy, the distance to the nearest city, a West Germany dummy, a variable indicating the change in financial situation, trust in the European Union institutions, a variable describing the interest in economic topics. Equation 1 is estimated as a Tobit model when the dependent variable is the money spent by the respondents and as OLS in the case of inflation expectations.

request). Similarly, as we divide households along other socio-economic characteristics, i.e. gender, household size, citizenship, distance to a city, residency in West or East Germany, their trust in European Union institutions, or their interest in economic affairs, no effect of the policies on the spending shares can be detected. Applying the same set of socio-economic variables to test for heterogeneous effects of the policy treatments on inflation expectations also shows that there are no particular group effects, with one notable exception. Respondents who claim to have a low interest in economic affairs expect that prices will rise by two to three percentage points less as a response to the transfer than the reference group with moderate interest in economic affairs. Overall, however, it occurs that slicing through the data in various dimensions does not elicit policy effects that an analysis based on the total sample could have obscured.

5 Conclusions

In the aftermath of the financial crisis a set of unconventional monetary policies was implemented by major central banks around the world. As they have partly resulted in outcomes not projected, in particular with respect to steering inflation expectations back to the levels envisaged by central banks, calls have been made to extend the toolbox to distributing helicopter money. Due to a lack of historical precedences little to nothing is known about the likely consequences of policies where the monetary authorities print money and give it to the people. Our survey among a representative sample of the German population which allowed us to randomly assign subjects to various policy treatments tests how households would react and whether the implementation of the policy would matter.

The results support the theoretical assertions that helicopter money could be used to increase nominal demand. Respondents in our survey spend on average 38% of a transfer (451 euro). The further 19% of a transfer (223 euro) that would go into debt

repayments could provide additional positive effects on a macro level by improving the financial position of the households. While we do not know whether households reduce their spending out of other income or wealth after the transfer (see, e.g., Bertrand and Morse, 2009), these stated amounts are non-trivial and similar to results of tax rebates research. However, all the policies do not achieve higher spending shares of households than what we can observe in our baseline of lottery wins. We also find that the policies are not capable of increasing inflation expectations.

These findings seem to be related to, first, the observation that the policies' influence on economic conditions is perceived rather negatively by the households. Very likely the unconventional monetary policies were not able to induce an increase in expected permanent income among our survey participants that would have put the marginal propensities to consume in the policy treatments ahead of the marginal propensities in the lottery treatment. Second, the difference in the shares of people expecting higher future taxes and government obligations as a result of the policies is rather small when comparing the money-financed fiscal stimulus with helicopter money. This might explain why policy treatments do not differ with respect to people's spending choices although respondents who expect a tighter fiscal policy in the future spend less of the transfer. Finally, policies would inject a great deal of uncertainty into the economy as evidenced by an increase in the variance of individuals' inflation expectations. This increase in uncertainty on the policies' outcomes among the households may also have contributed to their reluctance to spend a higher share of the government transfer. Overall, these results reveal a great deal of idiosyncratic behaviour by households that largely ignore general equilibrium effects of the policies and hardly respond to how transfer policies would actually be implemented.

While we consider these results to be interesting, one might argue that inference is limited due to the hypothetical questions asked in a survey study where we do not observe households' real choices. As economists we often have doubts about drawing

conclusions from what people say rather than what people do, although there is a growing literature that elicits spending behaviour using the hypothetical scenarios approach, see, e.g., Christelis et al. (2017), Fuster et al. (2018), or Jappelli and Pistaferri (2014). Actually, we do not think that this critique substantially undermines the value-added of our contribution for various reasons. First, it has been argued by others that this view is too limited with respect to what one can actually achieve with survey data (Shapiro and Slemrod, 1995). Indeed, more recent evidence suggests that intended consumption behaviour highly correlates with actual consumption. Bachmann et al. (2015) present evidence for a clear positive correlation between the average reported readiness to spend on durables in the Michigan Survey of Consumers and aggregate durables consumption recorded in the Federal Reserve Economic Database. Further evidence on a high correlation between people's answers on their intention regarding what to do with a government transfer and their actual behaviour comes from studies on the U.S. tax rebates in 2001 and 2008. For both transfer programs we have studies analyzing the effect of the tax rebate on how much survey respondents intended to spend, and how much they actually spent. For the tax rebate in 2001, the results based on respondents' intention in Shapiro and Slemrod (2003) translate into an average marginal propensity to consume of about one-third, which is in line with actual spending behaviour analyzed in Agarwal et al. (2007). Similarly, one can compare the measured intended consumption responses for the tax rebate in 2008, see Shapiro and Slemrod (2009), with actual spending behaviour (Parker et al., 2013). Again, these results suggest consistence. Second, a large part of our contribution deals with measuring the effects of the policies on households' expectations. It is very common that this information is retrieved from surveys. For example, inflation expectations are very often measured in this way. Third, given the type of research question, with hardly any data on actually conducted money-financed fiscal stimuli available, makes it necessary to recur to survey data in order to obtain any answers. It may be worthwhile to know what might happen even if this knowledge

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is based on survey data rather than having no idea at all about how households might react. Fourth, where possible, we drafted questions similar to existing survey data research on tax rebates to make results comparable at least in terms on how people were asked. This should give additional credibility to our results. Finally, the study by van Rooij and de Haan (2016) conducted parallel to our own with slightly different questions for Dutch households arrives, where results are comparable, at similar outcomes. Again, this should reduce concerns that our findings are linked to the very way questions have been phrased.

Nevertheless, we are aware that our results should be taken with a grain of salt for various other reasons. One could imagine that, if actually implemented, the most unconventional among the unconventional monetary policies would get a lot of media attention. It is difficult to predict how the public would be influenced and what this would imply for individual decisions on how to spend the money transferred. There is evidence that subjective knowledge about monetary policies is vulnerable to media influence and affects people's decisions (Hayo and Neuenkirch, 2018). Moreover, it is not so obvious to us whether our results could be extended to other countries. In the context of the European Monetary Union countries fare differently in economic terms. It could be the case that households in the periphery react differently to a helicopter treatment than German households. Having these difficulties in mind, we do, however, consider our results to be important as they add to a very scarce literature on the practical implications of helicopter money.

Supplementary Material

Supplementary material is available on the OUP website. These are the replication files and the online appendix.

The data used in this paper are available from GESIS Leibniz Institute for the Social Sciences, GESIS Panel `https://www.gesis.org/en/gesis-panel/data`.

Acknowledgments

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